

CMOS 4-Channel Analog Multiplexer/Demultiplexer

1 FEATURES

- **-3dB Bandwidth: 180MHz**
- **Single Supply Operation: +2.5V to +5.5V**
- **Low ON Resistance: 24Ω(TYP) With 5V Supply**
- **High Off-Isolation: -77dB (R_L = 50Ω, f = 1MHz)**
- **Break-Before-Make Switching**
- **Binary Address Decoding on Chip**
- **Operating Temperature Range: -40°C to +125°C**
- **PACKAGES: MSOP10**

2 APPLICATIONS

- **Sensors**
- **Analog and Digital Multiplexing and Demultiplexing**
- **A/D and D/A Conversion**
- **Signal Gating**
- **Battery-Operated Equipment**
- **Factory Automation**
- **Appliances**
- **Communications Circuits**

3 DESCRIPTIONS

The RS2255 is a CMOS analog IC configured as 4-channel multiplexers. This CMOS device can operate from 2.5 V to 5.5 V.

The RS2255 device are digitally-controlled analog switches. It has low on-resistance (24Ω TYP) and very low off-leakage current (1nA TYP).

The RS2255 is available in Green MSOP10 packages. It operates over an ambient temperature range of -40°C to +125°C.

Device Information ⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2255	MSOP10	3.00mm×3.00mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

4 Functional Diagrams of RS2255

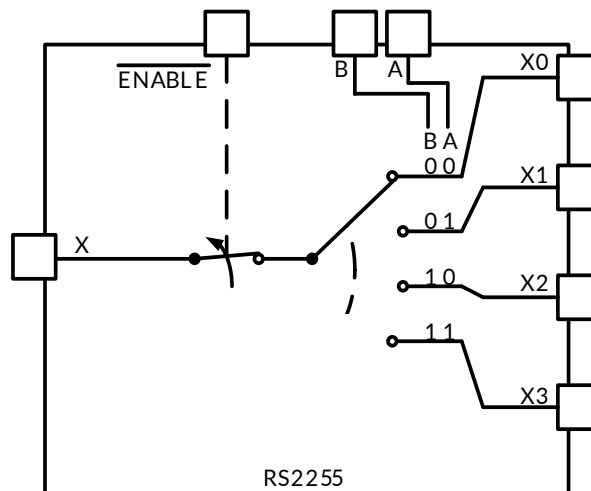


Table of Contents

1 FEATURES	1
2 APPLICATIONS	1
3 DESCRIPTIONS	1
4 Functional Diagrams of RS2255	1
5 Revision History	3
6 PACKAGE/ORDERING INFORMATION	4
7 PIN CONFIGURATIONS	5
8 SPECIFICATIONS	6
8.1 Absolute Maximum Ratings	6
8.2 ESD Ratings	6
8.3 Recommended Operating Conditions.....	6
8.4 ELECTRICAL CHARACTERISTICS	7
8.5 TYPICAL CHARACTERISTICS	9
9 Parameter Measurement Information	10
10 PACKAGE OUTLINE DIMENSIONS	12
11 TAPE AND REEL INFORMATION	13

5 Revision History

Note: Page numbers for previous revisions may differ from page numbers in the current version.

VERSION	Change Date	Change Item
C.4	2021/11/25	official version datasheet
C.5	2023/12/21	1.Added the TAPE AND REEL INFORMATION 2.Added MSL on Page 4@RevC.4 3.Update PIN DESCRIPTION on Page 2@RevC.4 4.Update ELECTRICAL CHARACTERISTICS
C.5.1	2024/03/08	Modify packaging naming

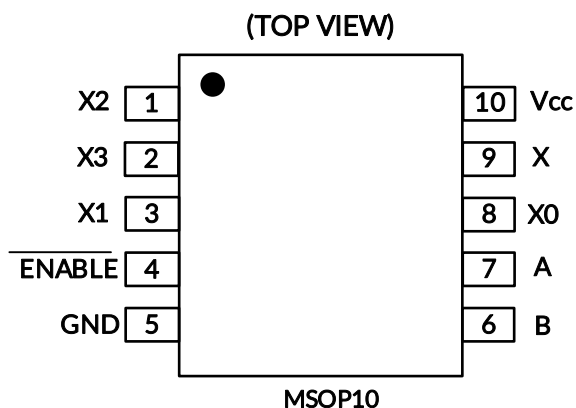
6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽²⁾	MSL ⁽³⁾	PACKAGE OPTION
RS2255	RS2255XN	-40°C ~+125°C	MSOP10	RS2255	MSL3	Tape and Reel,4000

NOTE:

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.
- (3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

7 PIN CONFIGURATIONS



PIN DESCRIPTION

NAME	PIN	FUNCTION
	MSOP10	
X2	1	Analog Switch Normally Open Input or Output 2.
X3	2	Analog Switch Normally Open Input or Output 3.
X1	3	Analog Switch Normally Open Input or Output 1.
$\overline{\text{ENABLE}}$	4	Inhibit. Drive $\overline{\text{ENABLE}}$ low or connect to GND for normal operation. Drive $\overline{\text{ENABLE}}$ high or connect to Vcc to turn all switches off.
GND	5	Ground.
B	6	Digital Address "B" Input.
A	7	Digital Address "A" Input.
X0	8	Analog Switch Normally Open Input or Output 0.
X	9	Analog Switch Common Input or Output.
Vcc	10	Positive Analog and Digital Supply Voltage.

FUNCTION TABLE

$\overline{\text{ENABLE}}$ INPUT	INPUT STATES		ON CHANNEL(S)
	B	A	
1	X	X	NONE
0	0	0	X0
0	0	1	X1
0	1	0	X2
0	1	1	X3

X=Don't care

NOTE: Input and output pins are identical and inter-changeable. Either may be considered an input or output; signals pass equally well in either direction.

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

SYMBOL	PARAMETER		MIN	MAX	UNIT
V _{CC}	Supply Voltage		-0.3	6	V
V _{IN}	Input Voltage (All inputs)		-0.3	V _{CC} +0.3	
I _{IN}	Switch Input Current	Any one input	-20	+20	mA
I _{PEAK}	Peak Switch Current	Pulsed at 1ms Duration, <10% Duty Cycle	-40	+40	
θ _{JA}	Package thermal impedance ⁽²⁾	MSOP10		200	°C/W
T _J	Junction Temperature ⁽³⁾		-40	150	°C
T _{stg}	Storage temperature		-65	+150	

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

(2) The package thermal impedance is calculated in accordance with JESD-51.

(3) The maximum power dissipation is a function of T_{J(MAX)}, R_{θJA}, and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / R_{θJA}. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±4500	V
		Charged-device model (CDM)	±1500	V



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

SYMBOL	PARAMETER	MIN	MAX	UNIT
V _{CC}	Supply Voltage	2.5	5.5	V
T _A	Operating temperature	-40	+125	°C

8.4 ELECTRICAL CHARACTERISTICS

$V_{CC} = 5.0\text{ V}$ or 3.3 V , FULL= -40°C to $+125^{\circ}\text{C}$, Typical values are at $T_A = +25^{\circ}\text{C}$. (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	V_{CC}	T_A	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
ANALOG SWITCH								
Analog Signal Range	V_{X-}, V_X			FULL	0		V_{CC}	V
On-Resistance	R_{ON}	$V_{CC}=5\text{V}, I_X=1\text{mA}$	5V	+25°C		24	30	Ω
				FULL			35	Ω
		$V_{CC}=3.3\text{V}, I_X=1\text{mA}$	3.3V	+25°C		50	60	Ω
				FULL			65	Ω
On-Resistance Match Between Channels	\overline{R}_{ON}	$V_{CC}=5\text{V}, I_X=1\text{mA}$ Switch ON	5V	+25°C		1	4	Ω
				FULL			5.3	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_{CC}=5\text{V}, I_X=1\text{mA}$ Switch ON	5V	+25°C		8	11	Ω
				FULL			14	Ω
X_ Off, X Off, X On, Leakage Current	$I_{X(OFF)}, I_{X(OFF)}, I_{X(ON)}$	$V_{CC}=5\text{V}, V_{X-}=1\text{V}, 4.5\text{V}$ $V_X=4.5\text{V}, 1\text{V}$	5V	+25°C		1	100	nA
		$V_{CC}=3.3\text{V}, V_{X-}=1\text{V}, 3\text{V}$ $V_X=3\text{V}, 1\text{V}$	3.3V	+25°C		1	100	nA
DIGITAL CONTROL INPUTS ⁽¹⁾								
Logic Input Logic Threshold High	$V_{AH}, V_{BH}, V_{ENABLE}$		5V	+25°C	1.7			V
			3.3V	+25°C	1.7			V
Logic Input Logic Threshold Low	$V_{AL}, V_{BL}, V_{ENABLE}$		5V	+25°C			0.5	V
			3.3V	+25°C			0.5	V
Input-Current High	$I_{AH}, I_{BH}, I_{ENABLE}$	$V_A, V_B, V_{ENABLE} = V_{CC}$	3.3V to 5V	+25°C		1	100	nA
Input-Current Low	$I_{AL}, I_{BL}, I_{ENABLE}$	$V_A, V_B, V_{ENABLE} = 0\text{V}$	3.3V to 5V	+25°C		1	100	nA

(1) All unused digital inputs of the device must be held at V_{IO} or GND to ensure proper device operation.

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

ELECTRICAL CHARACTERISTICS (continued)

V_{CC} = 5.0 V or 3.3V, FULL= -40°C to +125°C, Typical values are at T_A = +25°C. (unless otherwise noted)

PARAMETER	SYMBOL	CONDITIONS	V _{CC}	T _A	MIN	TYP	MAX	UNIT
DYNAMIC CHARACTERISTICS								
Address Transition Time	t _{TRANS}	V _{X-} = 3V/0V, R _L = 300Ω, C _L = 35pF, See Figure 2	5V	+25°C		160		ns
		V _{X-} = 3V/0V, R _L = 300Ω, C _L = 35pF, See Figure 2	3.3V	+25°C		240		ns
ENABLE Turn-On Time	t _{ON}	V _{X-} = 3V, R _L = 300Ω, C _L = 35pF, See Figure 3	5V	+25°C		90		ns
			3.3V			140		
ENABLE Turn-Off Time	t _{OFF}	V _{X-} = 3V, R _L = 300Ω, C _L = 35pF, See Figure 3	5V	+25°C		70		ns
			3.3V			100		
Break-Before-Make Time Delay	t _D	V _{X-} = 3V, R _L = 300Ω, C _L = 35pF, See Figure 4	5V	+25°C		50		ns
			3.3V			80		ns
Charge Injection	Q	R _S = 0Ω, C _L = 1nF, See Figure 5	5V	+25°C		6		pC
		R _S = 0Ω, C _L = 1nF, See Figure 5	3.3V			4		pC
Off Isolation	O _{ISO}	R _L = 50Ω, f = 1MHz, See Figure 6	5V	+25°C		-77		dB
-3dB Bandwidth	BW	R _L = 50Ω	5V	+25°C		180		MHz
			3.3V			180		MHz
Input Off-Capacitance	C _{X(OFF)}	f = 1MHz, See Figure 7	5V	+25°C		5		pF
Output Off-Capacitance	C _{X(OFF)}	f = 1MHz, See Figure 7	5V	+25°C		13		pF
Output On- Capacitance	C _{X(ON)}	f = 1MHz, See Figure 7	5V	+25°C		20		pF
Total Harmonic Distortion	THD	R _L = 600Ω, 5V _{P-P} , f = 20Hz to 20kHz	5V	+25°C		0.7		%
POWER REQUIREMENTS								
Power Supply Range	V _{CC}			FULL	2.5		5.5	V
Power Supply Current	I _{CC}	V _{CC} = 5.0V, V _A , V _B , V _{ENABLE} = V _{CC} or 0	5V	+25°C		0.001	2	uA
		V _{CC} = 3.3V, V _A , V _B , V _{ENABLE} = V _{CC} or 0	3.3V	+25°C		0.001	1	uA

8.5 TYPICAL CHARACTERISTICS

NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.

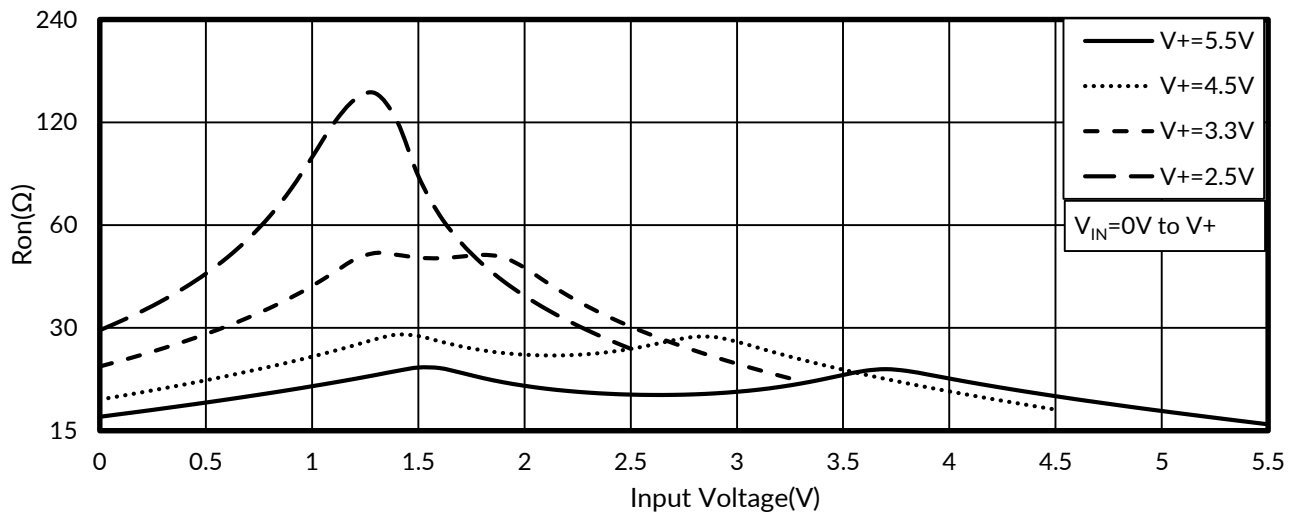


Figure 1. Typical Ron as a Function of Input Voltage

9 Parameter Measurement Information

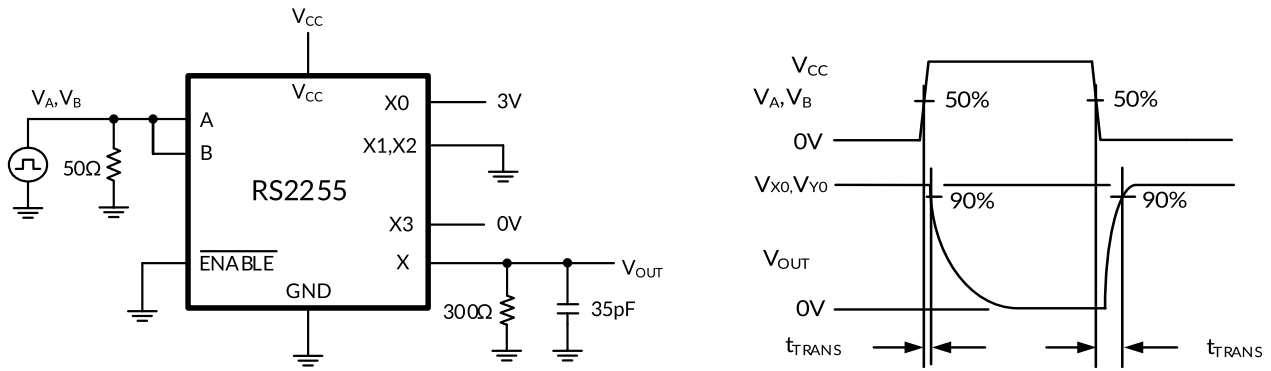


Figure 2. Address Transition Times (t_{TRANS})

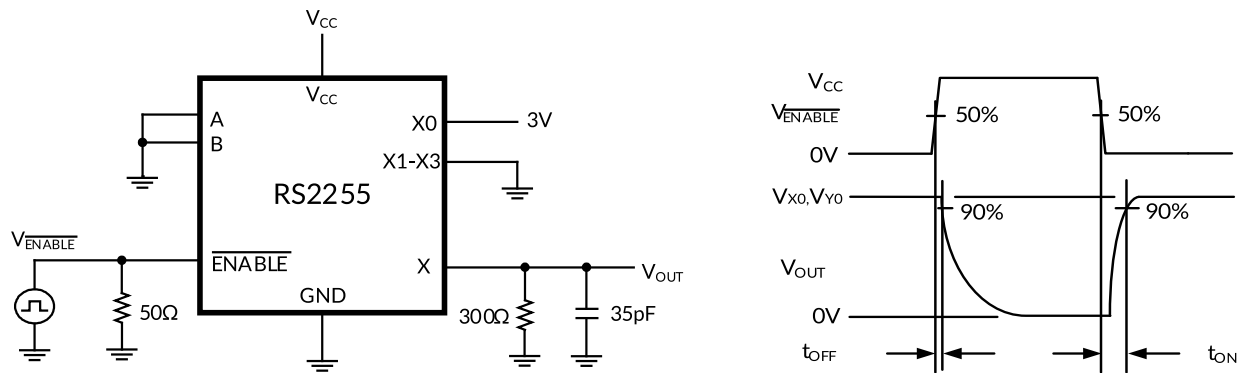


Figure 3. Switching Times (t_{ON} , t_{OFF})

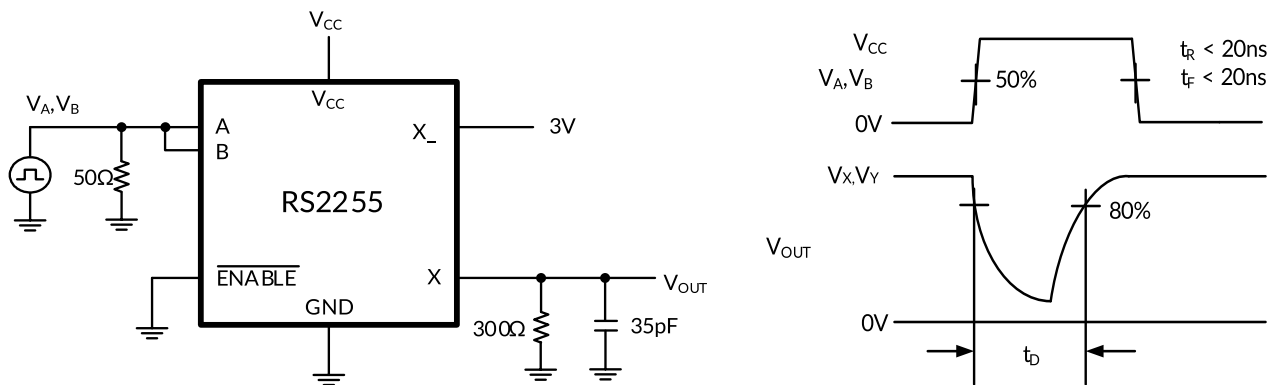


Figure 4. Break-Before-Make Time Delay (t_D)

Parameter Measurement Information (continued)

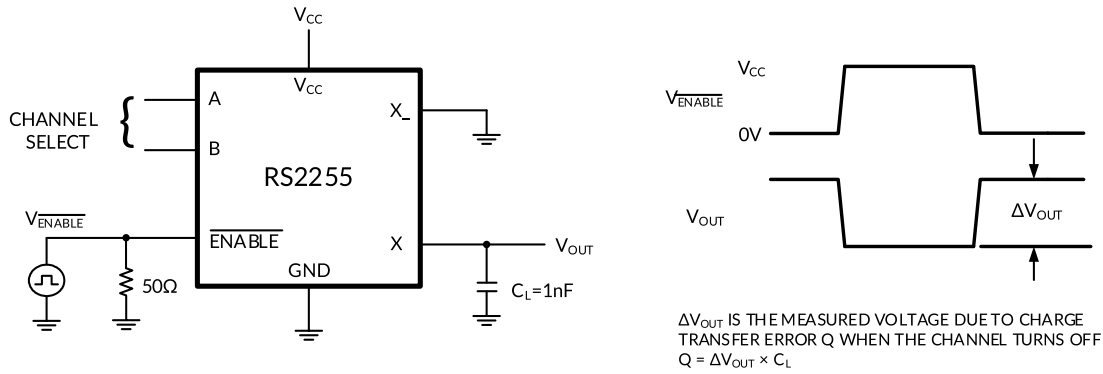
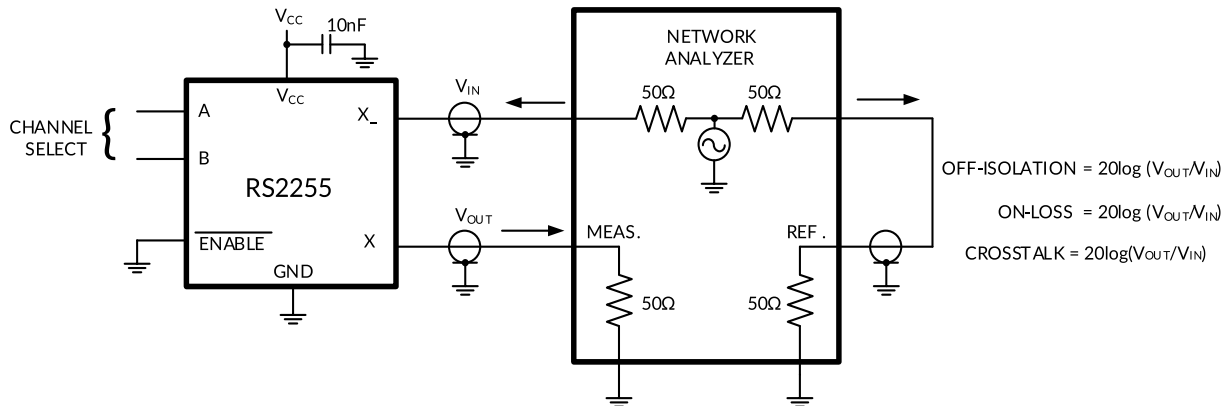


Figure 5. Charge Injection (Q)



MEASUREMENTS ARE STANDARDIZED AGAINST SHORT AT SOCKET TERMINALS .
 OFF-ISOLATION IS MEASURED BETWEEN COM AND "OFF" NO TERMINAL ON EACH SWITCH.
 ON-LOSS IS MEASURED BETWEEN COM AND "ON" NO TERMINAL ON EACH SWITCH.
 SIGNAL DIRECTION THROUGH SWITCH IS REVERSED ; WORST VALUES ARE RECORDED .

Figure 6. Off Isolation, On Loss

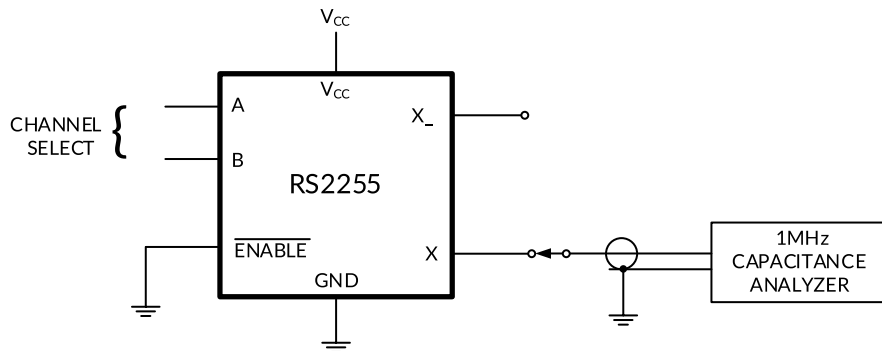
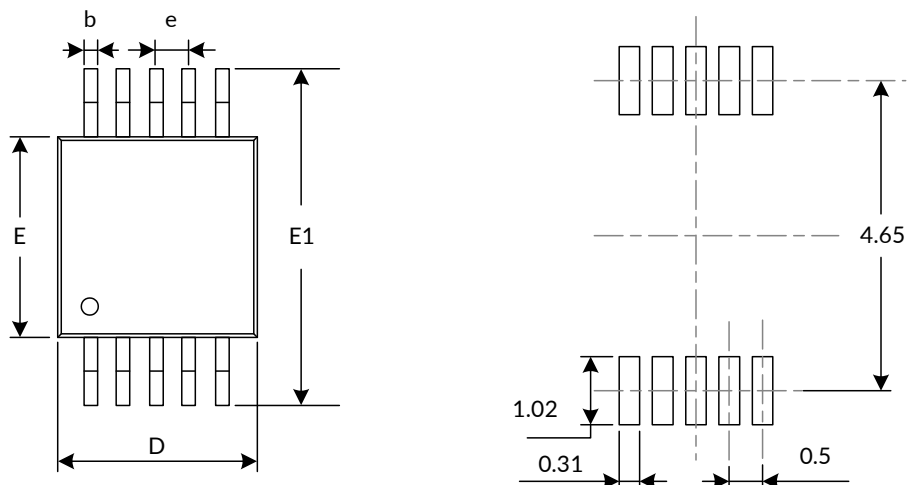


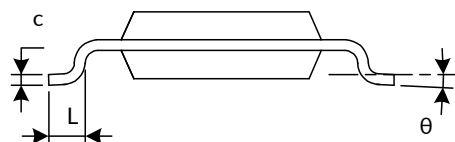
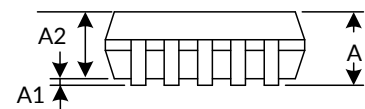
Figure 7. Capacitance

10 PACKAGE OUTLINE DIMENSIONS

MSOP10 ⁽³⁾



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A ⁽¹⁾	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D ⁽¹⁾	2.900	3.100	0.114	0.122
e	0.50(BSC) ⁽²⁾		0.020(BSC) ⁽²⁾	
E ⁽¹⁾	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

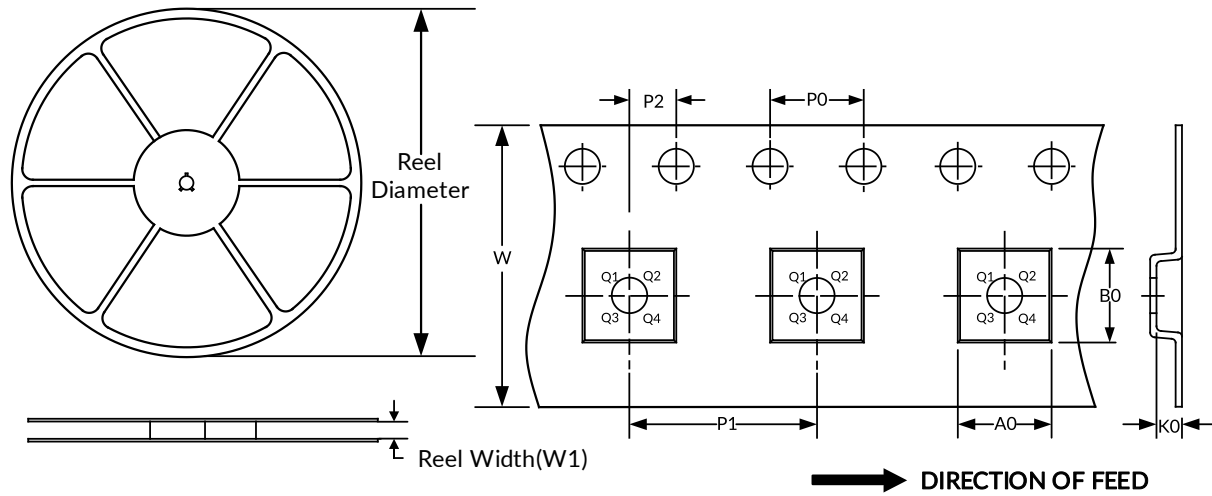
NOTE:

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

11 TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
MSOP10	13"	12.4	5.20	3.30	1.20	4.0	8.0	2.0	12.0	Q1

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

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